# State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
RELAY SERVICE FOR THE HEARING IMPAIRED
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AGENCY OF NATURAL RESOURCES
**Department of Environmental Conservation**
**Waste Management Division**
**103 South Main Street/West Office Building**
**Waterbury, Vermont 05041-0404**
**Phone: (802) 241-3888**
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September 27, 1996

CPT RAYMOND BOUCHARD
OFFICE OF THE ADJUTANT GENERAL
CAMP JOHNSON
COLCHESTER, VT 05446-3004

RE: Ethan Allen Firing Range, Jericho, Vermont, Site # 770051

Dear CPT. Bouchard:

The Sites Management Section (SMS) has received the Gasoline Tank Site Investigation & Groundwater Quality Report prepared by Watershed Environmental Services, Inc. The investigation focused on the removal of two (2) underground storage tanks at the Range control facility at the above referenced site. The investigation was conducted under the Site Investigation Expressway Program. Activities conducted during the investigation/removal include the removal of one (1) 2,000 diesel UST and one (1) 1,000 gallon gasoline UST, excavation and stockpiling of 12 cubic yards of petroleum contaminated soil, the advancement of five (5) soil borings, the installation and groundwater sampling of three (3) monitor wells for petroleum related volatile organic compounds (VOCs), the determination of the direction of groundwater flow and the identification of any sensitive receptors. Upon review of the report, the SMS has concluded the following:

- Petroleum related compounds were detected at concentrations below Ground Water Enforcement Standards (GWES) in samples collected from monitor wells MW-2 and MW-4.
- Groundwater flow is generally toward southwest at an approximate gradient of 1.5% .
- Limited sensitive receptors are in the vicinity of the site

Based on this information, the SMS requests one additional round of groundwater samples be collected from monitor wells MW-2 and MW-4 to confirm the initial investigation results. Samples should be analyzed by EPA Method 8020. At the time of sampling, the stockpiled soils should also be screened by PID. If the results of the second round of sampling confirm the initial groundwater analytical results (below GWES), and once the contaminated soils have been treated or disposed of, the SMS will consider this portion of the Ethan Allen Firing Range for a Site Management Activity Completed (SMAC) designation.

If you have any questions or need further information, please feel free to contact me at the phone/fax number or address identified at the top of the page.

Sincerely,

Michael W. Young
Asst. Hazardous Material Specialist
Sites Management Section

MWY/petro/7051redh.rev

cc: Mike Sparks, Watershed Env.

**Watershed Environmental Services, Inc.**

P.O. Box 64947 Burlington, Vermont 05406 Office: 802-860-7385 FAX: 802-860-1964 *51

# GASOLINE TANK SITE INVESTIGATION
# &
# GROUNDWATER QUALITY REPORT

VERMONT NATIONAL GUARD RANGE CONTROL FACILITY
ETHAN ALLEN FIRING RANGE
LEE RIVER ROAD
JERICHO, VERMONT

***Prepared for:***

LTC Alan L. Nye, P.E.
Facilties Management Officer
State of Vermont Adjutant Generals Office

***Prepared by:***

Michael K. Sparks
Principal Hydrogeologist
Watershed Environmental Services, Inc.

September 10, 1996

## 1.0 INTRODUCTION

The following is a report on the results of an investigation conducted by Watershed Environmental Services, Inc. to determine the degree and extent of petroleum contamination discovered during the closure of an underground gasoline storage tank at the Vermont National Guard's Range Control Facility at the Ethan Allen Firing Range on Lee River Road in Jericho, Vermont. Based on the detection of contaminant concentrations in soil above the Vermont Department of Environmental Conservation (VTDEC) action levels, evidence of groundwater impact, and proximity of potential sensitive receptors, the Vermont National Guard (State of Vermont Military Department) opted to participate in the VTDEC Site Investigation Expressway Program and proceed with the site investigation immediately.

A copy of the Site Investigation Expressway Notification form is provided in Appendix 1 (page 1). Also provided in Appendix 1 is a copy of the scope of services/work plan for the follow-up investigation prepared for the Vermont National Guard by Watershed Environmental Services, Inc. The original work plan specified a series of seven soil borings to define the extent of the contaminant plume with monitoring wells installed in four of the borings, water quality sampling and laboratory analysis for purgeable aromatic hydrocarbons; the scope of the investigation was later revised to include the completion of two additional soil borings.

## 2.0 PREVIOUS WORK

The Vermont National Guard's Range Control facility is located on Lee River Road in the town of Jericho, Vermont (see Site Map, Appendix 2, page 1). The last Category One underground storage tank on the property, a 1000 gallon gasoline underground storage tank (UST) was removed by MacIntyre Fuels, Inc. of Middlebury, VT on July 23, 1996. MacIntyre Fuels was supported by Watershed Environmental Services, Inc. who performed the tank removal site assessment and prepared the tank closure report for submission to the Vermont Department of Environmental Conservation (VTDEC) Underground Storage Tank Program.

The site assessment completed in concert with the tank removal found that soils and groundwater at the tank site had been impacted by gasoline released during use of the underground storage tank (UST). Physical inspection and photoionization detector (PID) evaluation of soil conditions at the underground tank site determined that the likely origin of the gasoline contamination was from overfills/spills at the tank fill pipe. The tank and piping were found to be in good condition with only minor surface corrosion; no perforations were observed in either the tank or piping and the tank system passed a tightness test conducted in April, 1996. The turpentine-like odor and relatively low PID signature of the gasoline-contaminated soil (the maximum PID concentration detected was 150 parts per million) are suggestive of an old fuel spill rather than a fresh or on-going gasoline release. Approximately 12 cubic yards

of gasoline contaminated soil were removed from the tank site and temporarily stockpiled on site.

PID screening of soil excavated during the removal of a 2000 gallon diesel fuel UST found no evidence of contamination in the portion of the site between the gasoline UST and the unnamed intermitted stream located 40 feet to the west. Two test pits excavated to the south of the gasoline UST site determined that the contaminant plume extended approximately 40 feet in a southerly direction toward the Range Control building. An EPA Method 8020 analysis of a sample of groundwater collected from a sump well located in the southwest corner of the basement of the Red House building (located approximately 140 feet south of the tank site) yielded no traces contamination.

Potential sensitive receptors in the vicinity of the Range Control tank site include the Lee River (located approximately 350 feet south of the tank site), its unnamed tributary (located approximately 40 feet to the west), and the Red House building (located approximately 100 feet to the south). There are no water supply wells on the premises nor within a 1/4 mile radius of the site. The closest neighboring property to the site is approximately 2000 feet to the west. Based on the topography and surface drainage patterns, the inferred direction of groundwater flow at the site is to the southwest. Thus, the primary sensitive receptor with a potential to be impacted if groundwater is significantly impacted is the Lee River.

The site investigation work plan proposed by Watershed Environmental Services, Inc. for the VNG Range Control site detailed the following activities:

1. Complete a series of seven soil borings with split-spoon soil sampling and PID (photoionization detector) screening to determine the severity and extent of contamination at the former fuel oil tank site and determine the potential for impact to nearby receptors. Upon completion of the soil boring activity, install four monitoring wells at locations appropriate to define the contaminant plume.

2. Sample the groundwater monitoring well array and submit the samples to a certified laboratory for analysis via EPA Method 8020 (volatile aromatic hydrocarbons).

3. Compete a monitoring well point elevation survey and collect groundwater level measurements to facilitate preparation of a water table contour map for the site.

5. Prepare a summary report for submission to the VTDEC Sites Management Section discussing the findings of the site investigation and making recommendations for future action.

The soil boring and monitoring well installation phase of the work plan was initiated on August 12, 1996.

## 3.0 SOIL BORING AND MONITORING WELL INSTALLATION

The soil boring and monitoring well installation was performed by Tri State Drilling and Boring, Inc. of West Burke, Vermont. A total of nine soil borings, four of which were equipped with monitoring wells, were completed at the site. The monitoring well array installed at the site includes an up-gradient monitoring well installed approximately 50 feet north of the gasoline UST site (designated MW-1), a monitoring well installed immediately down-gradient (south) of the tank site (designated MW-4) and two wells sited approximately 50 feet to the southeast and south of the gasoline tank site (designated MW-2 and MW-3 respectively). The five other soil boring sites spaced out along a traverse extending from a point approximately 50 west of the tank site to a point approximately 50 feet east of the tank site. The locations of the soil boring sites and monitoring well installations are depicted on the Water Table Contour Map and Contaminant Distribution Map provided in Appendix 2 (pages 2 and 4).

The soil borings and well installations were completed utilizing a rotary hollow-stem auger drilling machine and a split-spoon sampling tool to recover undisturbed soil samples. Driller's logs are provided in Appendix 3 (pages 4 -12). The drilling tools were decontaminated between borings and the sampling tools were decontaminated after each use. During the soil boring operation WES monitored breathing zone air quality conditions (utilizing an H-Nu Systems PI-101 photoionization detector or PID with a 10.2 eV lamp) and screened the auger spoils and recovered soil samples for the presence of volatile organic compounds (PID vapors). Soil descriptions and the PID vapor screening results are provided in the attached Soil Boring Log (see Appendix 3, pages 1- 3). Unless noted otherwise, all PID vapor measurements provided in the Soil Boring Logs are sample bag (1 quart-size, self-sealing plastic bags) head-space vapor readings.

The soil borings were completed with the installation of 2 inch diameter, schedule 40 PVC monitoring wells with F480 thread couplings and factory slotted 0.010' screen sections. The open bottom of the monitoring well tubes and the screen sections were wrapped with polyester filter fabric. All monitoring wells were completed to water quality-grade specifications which included silica filter sand packs, bentonite seals, and steel, flush-mounted well protectors. Well construction details are provided in the attached Soil Boring Logs (Appendix 3).

A discussion the rational for the soil boring/monitoring well siting, well construction and evaluation of the soil sampling results follows.

### 3.1 Soil Boring SB-1

Soil Boring SB-1 was sited at the southeast corner of the fenced compound surrounding the former underground storage tank farm. The soil boring was located approximately 40 feet east of the gasoline tank site. The soil profile at this location

consisted of a 4 ft.-thick layer of dry gravel fill overlying a layer of silty fine sands which extended to 5 feet below ground surface. No elevated PID vapor readings were noted in the upper 5 feet of the soil profile. PID vapor readings of only 0.1 ppm over background levels were detected in the moist, pebbly sand and gravel encountered between 5 feet and 10 feet bgs. In consideration of the absence of significant contamination at this location the soil boring was not outfitted with a monitoring well.

### 3.2 Soil Boring SB-2

The second soil boring, designated SB-2, was located at the southwestern corner of the fenced compound approximately 50 feet west of the gasoline UST site. The soil profile at this location consisted of a 5 ft. layer of dry gravel fill overlying a moist, olive gray silty fine sand to very fine sand layer containing organic matter. Soil recovered from 7 feet to 12 feet below ground surface were pebbly fine sands. No PID-detectable vapors were present in the unsaturated horizon while PID vapor levels of only 0.1 ppm over background were detected in the zone of saturation. The soil boring was plugged and abandoned based on the absence of significant contamination between the gasoline tank site and the intermittent stream to the west.

### 3.3 Soil Boring SB-3

The third soil boring, designated SB-3, was located approximately 37 feet south of the gasoline UST site. No evidence of contamination was detected in the upper 4 feet of the soil profile at this location. However, a layer of moist, fine sandy loam encountered at 4 to 5 feet bgs. yielded a PID vapor reading of 2.2 ppm over background levels. Saturated pebbly fine sands recovered from 5 to 7 feet bgs. yielded a PID reading of 1.4 ppm over background. The boring was plugged and abandoned in favor of drilling further to the south to better define the southerly limit of the contaminant plume.

### 3.4 Soil Boring SB-4

Soil boring SB-4 was sited 20 feet east of soil boring SB-3 and approximately 30 feet southeast of the tank site to determine if contamination was migrating in southeasterly direction from the tank site. A maximum PID vapor reading of 0.1 ppm over background levels was detected in the soil profile at this location. Based on the absence of significant contamination at this location, no monitoring well was installed in the soil boring (which was plugged and abandoned).

### 3.5 Soil Boring SB-5

The fifth soil boring, designated SB-5, was sited approximately 25 feet southwest of the gasoline tank site. No evidence of contamination was detected in the dry gravel

fill comprising the upper 4 feet of the soil profile at this location. However, wet silty fine sands recovered from 4 to 6 feet below yielded PID vapor readings of 13.2 ppm over background. This boring was abandoned in favor of drilling further to the southwest to determine the limit of the contaminant plume.

3.6 Soil Boring/Monitoring Well MW-1

Soil boring site MW-1 was located 50 feet north of the gasoline UST site to monitor water quality conditions up-gradient of the tank site. PID screening of auger spoils and split-spoon soil samples recovered from boring MW-1 detected no evidence of petroleum contamination in the upper 5 feet of the soil profile. Soil recovered from 5 feet to 12 feet below ground surface (bgs) yielded PID vapor levels 0.1 ppm above background levels (0.4 ppm). The slight increase in PID vapor levels coincided with the presence of saturated soil conditions. The soil profile consists of approximately 4.5 feet of dry, brown gravelly fill overlying a 5.5 ft layer of silty fine sands. At 10 feet bgs. the soil graded upward to a sandy gravel

Moist soil conditions were first observed at 4.5 feet bgs. with saturated conditions detected at 5 feet below ground surface. No soil discoloration, petroleum odors or sheens were discernible in this soil boring. The soil boring was completed with the installation of a water quality-grade monitoring well device constructed with a 5 ft. screen section extending from 4 - 9 feet bgs. (to screen across the water table).

3.7 Soil Boring/Monitoring Well MW-2

Soil boring MW-2 was sited 60 feet to the southwest of the tank site to evaluate conditions in the suspected path of contaminant migration. No evidence of contamination was detected in the upper 4 feet of the soil profile, a gravel fill with abundant stones and cobbles. PID vapor readings of 0.4 ppm over background levels were detected in a very fine sandy silt loam layer (believed to be the old ground surface) extending from 4 to 5 feet bgs. A saturated silty fine sand layer extending from 5 to 7 feet yielded PID vapor readings of 0.7 ppm over background. From 7 feet to 12 feet the soil graded downward from a silty gravel to a pebbly fine sand; PID vapor readings in this horizon were 0.5 ppm over background levels. No free phase product or petroleum sheens were noted in the soils recovered from within the zone of saturation.

The boring was completed with the installation of a monitoring well equipped with a 7 ft. screen section extending from 3 ft. to 10 ft. below ground surface.

3.8 Soil Boring/Monitoring Well MW-3

Soil boring MW-3 was sited approximately 55 feet to the south of the tank site to determine if contaminants are migrating in the direction of the Range Control and Red

House buildings. The soil profile at this location consisted of 5 feet of gravel fill overlying saturated sand and silty sands. PID vapor readings ranged from 0.4 ppm in the vadose zone to 1.1 ppm at the water table and 0.6 ppm within the zone of saturation. No free phase product or petroleum sheens were visible in the soils recovered from within the zone of saturation.

The boring was completed with the installation of a monitoring well equipped with a 7 ft. screen section extending from 3 ft. to 10 ft. below ground surface.

### 3.9 Soil Boring/Monitoring Well MW-4

Soil boring MW-4 was sited approximately 10 feet south of the gasoline tank excavation to determine the severity and vertical extent of the gasoline contamination at the tank site. During the tank removal activity a test pit excavated approximately 4 feet to the east of the soil boring site yielded PID vapor readings in soil at the water table of 150 ppm and light petroleum sheens were visible on the water surface. The PID vapor concentrations in the test pit were higher than the PID vapor readings observed in soil surrounding the gasoline tank proper, indicating that contaminants had migrated in a southerly direction from the tank site.

The upper 4 feet of the soil profile at soil boring site MW-4 was a dry gravel fill which yielded a PID vapor reading of 0 to 0.4 ppm above background levels. Moisture was detected in a fine to medium sand layer extending from 4 to 5 feet below ground surface, below which a dark gray and black discolored coarse sand bearing a moderately strong stale gasoline odor was encountered. The zone of visible discoloration extended down to a depth of 10 feet; this horizon yielded PID vapor levels of up to 110 ppm. Soil recovered for 10 to 12 feet bgs. via the split-spoon sampling tool was a brown stony coarse sand which bore no visible evidence of contamination and PID vapor readings of only 1.1 ppm above background levels.

The boring was completed with the installation of a monitoring well constructed with a 7 ft. screen section extending from 3 to 10 feet below ground surface. No free phase product or petroleum sheens were visible on the water removed from the well during its development immediately after the well installation.

## 4.0 GROUNDWATER QUALITY SAMPLING RESULTS

The monitoring well array was developed and sampled by Watershed Environmental Services (WES) on August 20, 1996. Prior to developing the wells for sampling, the well bores were subjected to PID vapor screening (head-space screening) and water level measurements were taken. The water level measurements along with the well point elevation data are tabulated in Table 1 provided in Appendix 2 (page 3). The monitoring well bore head-space PID readings are provided in Table 2 (see Appendix 3, page 1). Table 2 also summarizes the results of the laboratory assays of the

groundwater samples. The individual laboratory report forms for the groundwater sample analyses are provided in Appendix 4.

### 4.1 Sampling Methodology and Procedures

Prior to sampling, the groundwater monitoring wells were developed with a disposable polyethylene plastic bailer. A minimum of three well-volumes of groundwater were removed during the well development procedure to insure sampling of fresh groundwater. After development, the disposable bailers were used to collect the record groundwater samples. A new bailer was utilized at each sampling location.

The water quality samples were collected in 40 ml VOA containers equipped with Teflon septa and stored in a cooler on ice until delivery to the laboratory. All samples were analyzed in the laboratory for purgeable aromatic hydrocarbons (BTEX and MTBE) via EPA Method 8020. A trip blank sample, consisting of a distilled water sample placed in a 40 ml VOA vial, was prepared by the laboratory when the sample containers were picked up by the sampler just prior to the groundwater sampling date and accompanied the samples until delivery to the laboratory. The trip blank sample was analyzed along with the groundwater samples by the laboratory as part of the sample handling QA/QC procedure. No contamination was detected in the trip blank sample (see Appendix 4, pages 1 and 6).

### 4.2 Field Measurements and Observations

The results of the water level gauging are tabulated on the attached Table 1 (see Appendix 2, page 3). Depths to the water table at the site as measured on August 20, 1996 ranged from approximately 5 feet at well MW-4 (at the tank site) to just over 6 feet at well MW-3 (55 feet south of the tank site).

Contouring of the water table elevations calculated for the groundwater monitoring wells indicates that groundwater flow is predominantly to the southwest at a gradient of approximately 1.5%. The water table contouring indicates that monitoring well MW-2 is in the best position to intercept any dissolved phase contaminants migrating from the gasoline tank site. The elevation survey also established that the bottom of the intermittent stream located approximately 40 feet west of the tank site is 4 to 5 feet higher in elevation than the water table at the site. Thus, it is unlikely that dissolved-phase contaminants migrating from the tank site will significantly impact this surface water body.

Inspection of groundwater removed during the well development operation found no evidence of free phase product or petroleum sheens in ground water at wells MW-1, MW-2 and MW-3. However, light petroleum sheens were observed in water removed from well MW-4. All the wells recharged quickly. The pre-sampling PID head-space screening of the monitoring wells detected no elevated PID vapor

readings in well MW-2 while PID vapor levels of 0.4 ppm over background levels were present in wells MW-1 and MW-3. Monitoring well MW-4 yielded a PID vapor reading of 10.1 ppm over background levels. The Monitoring well PID screening results are summarized in Table 2 (Appendix 4) and depicted on the attached Contaminant Distribution Map (see Appendix 2, page 4).

### 4.3 Groundwater Sampling Results

The results of the EPA Method 8020 laboratory assays of groundwater collected from the monitoring well array are tabulated below. The sampling results confirm that the gasoline released at the former underground gasoline storage tank site has impacted groundwater at the site, however the degree of groundwater contamination is within allowable limits at set forth in the Vermont Department of Environmental Conservation's *Chapter 12 Ground Water Protection Rule and Strategy*.

| EPA Method 8020 | Enforcement Limit (ppb) | STATION / CONCENTRATION | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | | MW-1 | MW-2 | MW-3 | MW-4 | Trip Blank |
| Benzene (ug/L) | 5 | <1 | 3.1 | <1 | 1.2 | <1 |
| Ethylbenzene (ug/L) | 680 | <1 | 8 | <1 | 1.7 | <1 |
| Toluene (ug/L) | 2420 | <1 | 1.2 | <1 | <1 | <1 |
| Xylene (ug/L) | 400 | <1 | 10. | <1 | 6.2 | <1 |
| MTBE (ug/L) | 40 | <10 | <10 | <10 | <10 | <10 |
| Total BTEX (ug/L) | | <1 | 22.3 | <1 | 9.1 | <1 |
| Head-space PID (ppm) | 20 ppm | 1.4 | 1.0 | 1.4 | 11.1 | |

Note: Background PID reading = 1.0 ppm

A Benzene concentration of 3.1 parts per billion (ppb) was detected in groundwater at monitoring well MW-2 located approximately 60 feet southwest of the tank site. This concentration represents the highest concentration of Benzene detected in groundwater at the site and is below the 5 ppb Enforcement Limit for this contaminant. Groundwater sampled at well MW-4, just down-gradient of the gasoline tank site, yielded a Benzene concentration of only 1.2 ppb. The maximum concentrations of Toluene (1.2 ppb), Ethylbenzene (8 ppb) and Xylene (10 ppb) are all well below the Enforcement Limit concentrations for these contaminants. No contaminants were detected in the EPA Method 8020 assays of groundwater sampled from wells MW-1 (the up-gradient monitoring point) and MW-3 (55 feet south of the tank site).

## 5.0 SENSITIVE RECEPTOR SURVEY

The survey of potential sensitive receptors performed during the tank removal on July 23, 1996 and again during the soil boring and groundwater sampling of August 12 and 20, 1996 found that the only sensitive receptors impacted by the gasoline release at the Range Control are soil and groundwater in the immediate vicinity of the

former gasoline tank. The relative absence of significant levels of soil vapor and dissolved-phase contaminants in the soil borings/monitoring wells installed down-gradient of the gasoline UST site indicate that none of the potential sensitive receptors down-gradient of the tank site (the Range Control/Red House building complex, the Lee River, and the neighboring properties) are likely to be impacted by the presence of gasoline contamination at the Vermont National Guard's Range Control facility site.

The closest known water supply well to the site is over 1/4 mile to the west of the Range Control site. Given that the maximum level of contamination in groundwater at the site is 3.1 ppb Benzene and 22.3 ppb total BTEX, the potential for petroleum contaminants at the Range Control gasoline tank site to impact water supply wells in the vicinity of the site is considered to be low.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the PID vapor screening of soil and laboratory assay of groundwater sampled at the Range Control site indicates that the removal of the 1000 gallon underground gasoline storage tank and approximately 12 cubic yards of gasoline-contaminated soil has effectively eliminated the source for the petroleum contamination detected in the subsurface environment at the site. The nine soil borings completed for this investigation have satisfactorily delineated the area of contamination which appears to be confined to the Vermont National Guard property.

The EPA Method 8020 laboratory assays of groundwater sampled from the four monitoring wells installed at the site indicate that the VTDEC groundwater enforcement standards are met on the entire site. Additionally, the maximum PID vapor reading detected in the four monitoring wells installed at the site is 10 ppm, which 50% less than the VTDEC soil guideline limit of 20 ppm for gasoline contaminants in soil. Based on the absence of detectable contamination in the upper 4 feet of the soil profile at the gasoline tank site, it is unlikely that gasoline contaminants remaining in the deeper portions of the soil profile pose a significant exposure threat to persons working on the property. Additionally, the absence of significant concentrations of PID vapors in the monitoring wells and test pit excavations proximal to the tank site indicate that the potential for exposure via vapor migration into neighboring buildings is minimal. As there are no groundwater discharge zones or water supply wells in the immediate vicinity of the site, and the closest surface water body is located 350 feet from the tank site, the potential for significant impact to the environments and threats to human health via exposure or ingestion of contaminated groundwater is also considered to be minimal.

As environmental conditions at the Vermont National Guard Range Control site satisfy all the VTDEC Site Management Activity Completed criteria, we recommend this site for closure as soon as the approximately 12 cubic yards of gasoline contaminated soil currently stockpiled at the site have been properly disposed.

State of Vermont

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Department of Forests, Parks and Recreation
Department of Environmental Conservation
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# SITE INVESTIGATION EXPRESSWAY NOTIFICATION

Site Owner: State of Vermont Military Department

Site Name, Town: Range Control, Ethan Allen Firing Range, Jericho

✓ Yes, this site will participate in the Site Investigation Expressway Process.

___ No, this site will not participate in the Site Investigation Expressway Process.

If yes, please complete the checklist below:

✓ Contamination present in soils above action levels ✓ Yes ___ No

If yes; summarize levels:
PID 140ppm

✓ Free product observed ✓ Yes ___ No Sheens

✓ Groundwater contamination observed ✓ Yes ___ No

✓ Surface water contamination observed ___ Yes ✓ No

✓ Suspected release of hazardous substances ___ Yes ___ No

If yes, please explain:

✓ Affected receptors ✓ Yes ___ No

If yes, please identify receptors including names and addresses of third party receptors:
Soil
Groundwater

Please provide an estimated date of when you expect to submit Site Investigation Report: _____

# Watershed Environmental Services, Inc.

P.O. Box 64947 Burlington, Vermont 05406 Office: 802-860-7385 FAX: 802-860-1964 *51


July 28, 1996

FILE

LTC Alan L. Nye, P.E.
Facilities Management Officer
State of Vermont Adjutant Generals Office
Building #5, Camp Johnson
Colchester, VT 05446-3004

Re: Vermont National Guard
Range Control Facility, Ethan Allen Firing Range, Jericho, VT
Proposal for Gasoline Tank Site Investigation

Dear Colonel Nye:

I am pleased to provide for your consideration the enclosed proposal/cost estimate for an environmental site investigation designed to determine the extent and severity of gasoline contamination discovered at the Range Control facility in Jericho. I have solicited quotations for drilling and well installation services from two reputable contractors - Tri-State Drilling & Boring, Inc. of West Burke, VT and M&W Soils Engineering, Inc. of Charlestown, NH. As the two drilling firms had comparable pricing (the quotes differed by only $8), the costing provided in the attached proposal will work for either contractor.

While the test pit investigation we performed at the time of the tank removal determined the extent of soil contamination directly down-gradient of the tank site, additional testing is needed to map-out the full extent and severity of the gasoline contamination in soil and groundwater proximal to the tank site. Therefore, the work plan we propose for the Range Control site consists of the following activities:

1. Drilling of seven soil borings with photoionization detector (PID) screening of split-spoon soil samples to delineate the contaminant plume. By establishing the depth and lateral extent of the soil contamination we can calculate the volume of contaminated soils at the site and thereby develop an estimate of soil excavation and disposal costs (if remediation is deemed necessary).

2. Selection of four soil borings for the installation of groundwater monitoring wells; well locations will be chosen on the basis of the PID soil screening results.

3. Collection of groundwater samples from the four monitoring wells for laboratory analysis and survey the well point elevations. This information will enable us to determine the severity of groundwater impact, delineate the groundwater

contaminant plume and calculate the direction of groundwater flow to determine the potential for impact to sensitive receptors (i.e. surface waters, occupied structures, etc.).

4. Lastly, we will prepare a written report on our findings. The report will include copies of all analytical data, soil boring and monitoring well installation logs, contaminant distribution and water table contour maps, conclusions and recommendations on any follow-up work.

Feel free to call if you have any questions or if I can be of further assistance. Thank you for the opportunity to quote this work for you.

Sincerely,

Michael K. Sparks
Principal Hydrogeologist

enclosure

*mks/7-28-96/vng-jeri.ce1*

# Watershed Environmental Services, Inc.

P.O. Box 64947 Burlington, Vermont 05406 Office: 802-860-7385 FAX: 802-860-1964 *51

## SCOPE OF SERVICES
## Underground Storage Tank Site Investigation
## Vermont National Guard Ethan Allen Firing Range
## Range Control Facility
## Lee River Road, Jericho, Vermont



***Prepared for:***
LTC Alan Nye, P.E.
Facilities Management Officer
Camp Johnson, Colchester, VT

***Location:***
VTANG Ethan Allen Firing Range
Range Control Facility
Lee River Rd, Jericho, VT

**ACTIVITY 1: SOIL BORING AND MONITORING WELL INSTALLATION SUPERVISION**

*Watershed Environmental Services* to coordinate project with VT National Guard and subcontractors, prepare Site Safety Plan and supervise drilling of seven soil borings and installation of four monitoring wells (approx. 10' deep), screen soils for presence of contaminants with photoionization detector, and prepare soil boring log.

| | |
|---|---|
| • Hydrogeologist: $50/hr. x 14 hrs | $700.00 |
| • Mileage expenses: $0.30/mile x 80 miles | $24.00 |
| • PID rental: $60/day x 1 day | $60.00 |
| | $784.00 |

**ACTIVITY 2: SOIL BORING AND MONITORING WELL INSTALLATION**

*Environmental Drilling Contractor* with rotary hollow-stem auger drilling machine to complete seven 10-ft. deep soil borings with soil sample recovery and complete installation of four 2 inch diameter PVC water quality-grade groundwater monitoring wells. Well installation includes steel, flush-mounted protective casings set in concrete.

| | |
|---|---|
| • Mobilization: $250 | $250.00 |
| • Drilling machine: $120/hr. x 8 hrs | $960.00 |
| • Well materials: $110/well x 4 wells | $440.00 |
| • Well protectors installation: $148 x 4 wells | $592.00 |
| • Steam cleaning: $55 | $55.00 |
| | $2297.00 |

**ACTIVITY 3: GROUNDWATER SAMPLING AND WELL POINT ELEVATION SURVEYING**

*Watershed Environmental Services* to complete groundwater sampling and perform well point survey for construction of water table contour map. Sampling via disposable bailers. *Endyne, Inc.* to perform laboratory analysis of groundwater samples for BTEX and MTBE (4 groundwater samples plus trip blank sample).

| | |
|---|---|
| • Hydrogeologist: $50/hr. x 8 hrs | $400.00 |
| • Sampling equipment: $10/well x 4 wells | $40.00 |
| • Transit rental: $50 | $50.00 |
| • Laboratory fees: | |
| EPA Method 8020 (BTEX & MTBE): $60/sample x 5 samples | $300.00 |
| | $790.00 |

**ACTIVITY 4: REPORT**

*Watershed Environmental Services* to prepare a summary report on the findings of the tank site investigation. Report to include a site map, area map, contaminant distribution map, water table contour map, soil boring logs, copies of all analytical data, conclusions and recommendations.

| | |
|---|---|
| • Hydrogeologist: $50/hr. x 12 hrs | $600.00 |
| • Draftsman: $30/hr x 3 hrs | $90.00 |
| • Binding and mailing: $12 | $12.00 |
| | $702.00 |

**Total Cost : $4573.00**

**Terms and Conditions**

- Terms: Net 30 days from date of invoice;
- This cost estimate is not a not-to-exceed bid, however costs shall not exceed 15% of the estimated price without prior authorization from the client.
- Optional activities or work outside the scope of services performed at the client's request shall be billed on a time and materials basis.
- Material and subcontractor expenses billed at cost plus 10%.
- Watershed Environmental Services , Inc. and its subcontractors shall have no responsibility whatsoever for, and the Owner shall indemnify, defend and hold Watershed Environmental Services, Inc. harmless from, any liability, claim, or cost (including reasonable attorney's fees), arising from the existence and/or discovery of any hazardous waste or substance and/or other contamination on-site. In the event any such hazardous waste and/or contamination is discovered in the course of the project, the Owner shall immediately take all steps required by state and/or federal law to notify the appropriate authorities and otherwise comply with all applicable state and federal laws. Watershed Environmental Services, Inc.'s liability to the Owner for any claim of any kind whatsoever arising in connection with the project shall be strictly limited to the amount paid by the Owner to Watershed Environmental Services, Inc. for its work on the project.
- Watershed Environmental Services, Inc. and its subcontractors shall not be responsible for any losses or expenses incurred as a result of, or repair/replacement costs for damage to underground structures or utilities not properly located by the Owner.
- Costs for contaminated material clean up and disposal are not included in the base bid price.
- Base bid price does not include replacement of disturbed pavement or concrete sidewalk.
- Date effective: July 28, 1996. This quote is valid for 60 days from date effective.

**Given by:**

**Accepted by:**

_____ _____

**Michael K. Sparks, Watershed Environmental Services**

**Date:**

_____

STATE OF VERMONT
OFFICE OF THE ADJUTANT GENERAL
CAMP JOHNSON
COLCHESTER
05446-3004
(802) 654-0300

5 August 1996

Mr. Michael K. Sparks
Watershed Environmental Services, Inc.
P.O. Box 64947
Burlington, VT 05406

Dear Mr. Sparks:

RE: Groundwater Monitoring Well Installations @ Range Control, Ethan Allen Firing Range, Jericho, VT

This letter shall serve as your official "Notice to Proceed". The terms of the agreement are per the scopes of services and letter dated 28 July 1996 that were submitted by you. The agreed upon total cost is $4,573.00, and includes seven soil borings and installation of four monitoring wells. The borings and monitoring wells shall reach depths of an approximate ten feet.

The following are clarifications and additional stipulations to the agreement:

1. Any changes of the original quote must be approved in writing prior to proceeding.

2. All invoicing for this project must be received at this office no-later-than 16 September 1996.

3. The planned placement of the three wells must be marked on the attached sketch by you and submitted to this office for review and approval prior to commencement of work.

Major Raymond Bouchard shall continue as the project coordinator. Please direct coordination and questions to him at (802) 654-0306. As in the past, we look forward to working with you.

Sincerely,

ALAN L. NYE, P.E.
Lieutenant Colonel, VT Army Nat'l Guard
Facilities Management Officer

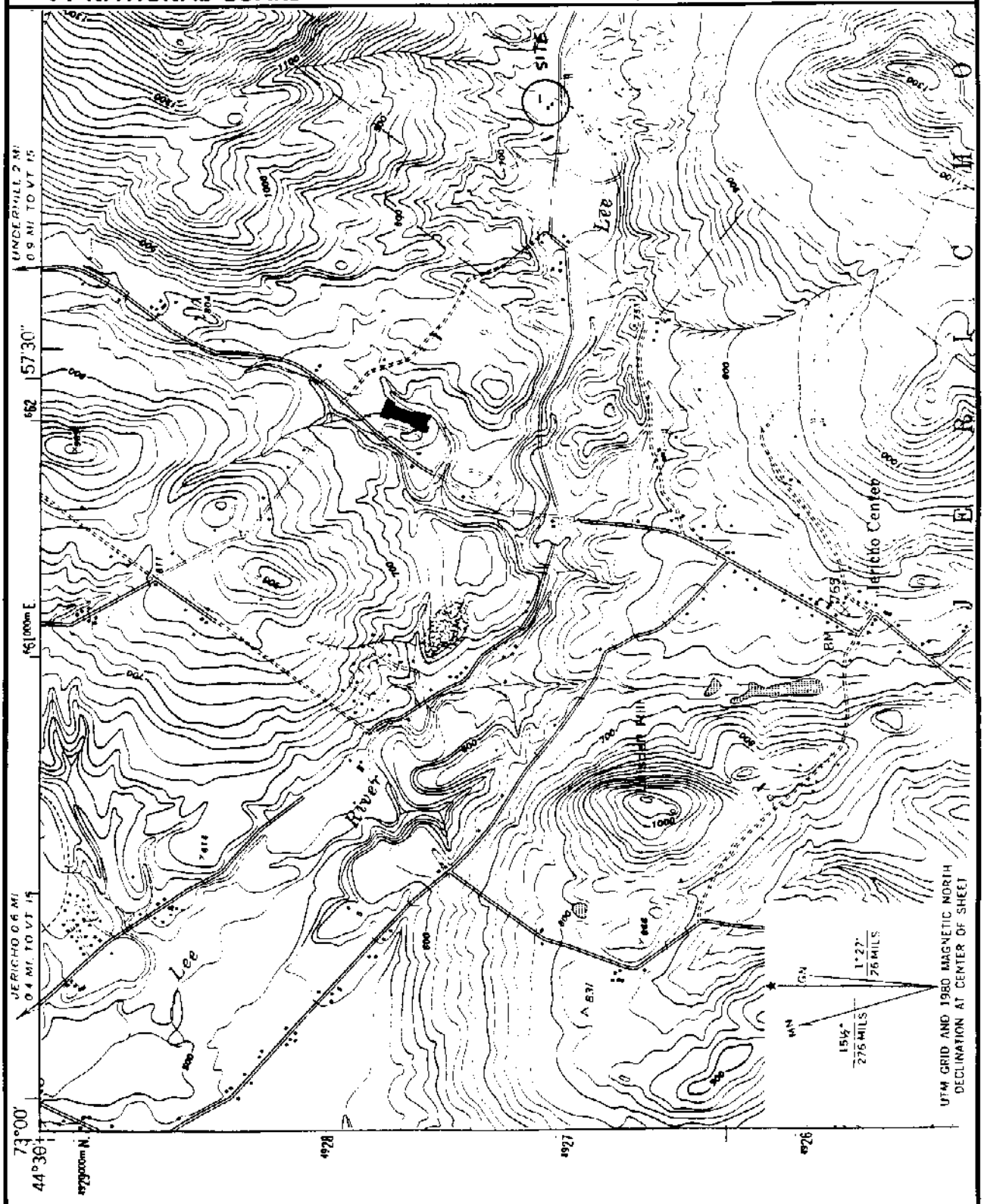
Attachments

C:\OFFICE\WPWIN\WPDOCS\BF\GWMONITR.WPD

ebf

# U.S.G.S TOPOGRAPHIC MAP SECTION - SITE MAP

## VT NATIONAL GUARD RANGE CONTROL FACILITY, LEE RIVER RD., JERICHO

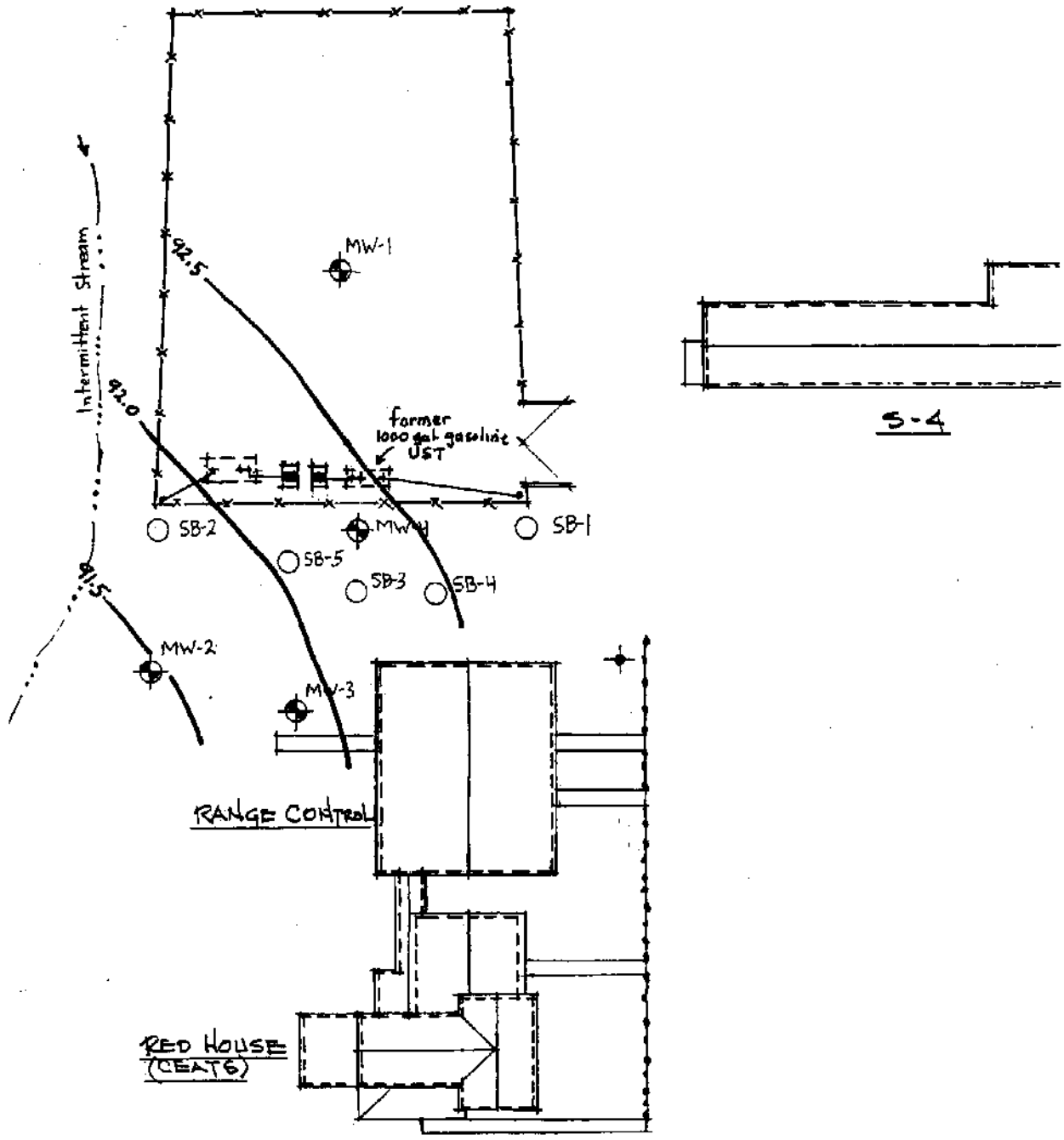



| | |
|---|---|
| ***Scale:*** 1: 24,000<br>***Contour Interval:*** 20 ft.<br><br>***Map Source:***<br>U.S.G.S. Richmond Quadrangle, 1980<br>U.S. Geological Survey | ***Prepared:*** July 28, 1996<br><br>**WATERSHED ENVIRONMENTAL SERVICES, INC.**<br>P.O. Box 64947<br>Burlington, Vermont 05406 |

# GROUNDWATER CONTOUR MAP

## RANGE CONTROL FACILITY

## VT NATIONAL GUARD ETHAN ALLEN FIRING RANGE, JERICHO, VT




| | |
|---|---|
| *Scale:* 1" = 40' *Contour Interval*: 0.5 ft.<br>*Date of Measurement:* August 20, 1996<br>*Map Source:*<br>Vermont Army National Guard<br>Camp Johnson, Colchester, VT | *Prepared:* August 30, 1996<br><br>**WATERSHED ENVIRONMENTAL SERVICES**<br>P.O. Box 64947<br>Burlington, Vermont 05406 |

VERMONT NATIONAL GUARD RANGE CONTROL FACILITY
ETHAN ALLEN FIRING RANGE, JERICHO, VT

## TABLE 1
## MONITORING WELL POINT AND GROUNDWATER ELEVATIONS
**20 August, 1996**

| STATION | WELL ELEVATION (Top of Pipe) | WATER LEVEL | WATER TABLE ELEVATION |
|---|---|---|---|
| MW-1 | 98.89 | 6.08 | 92.81 |
| MW-2 | 97.62 | 6.14 | 91.48 |
| MW-3 | 98.09 | 6.21 | 91.88 |
| MW-4 | 97.28 | 4.95 | 92.33 |
| Stream bed #1 | 97.16 | 0 | 97.16 |
| Stream bed #2 | 96.69 | 0 | 96.69 |

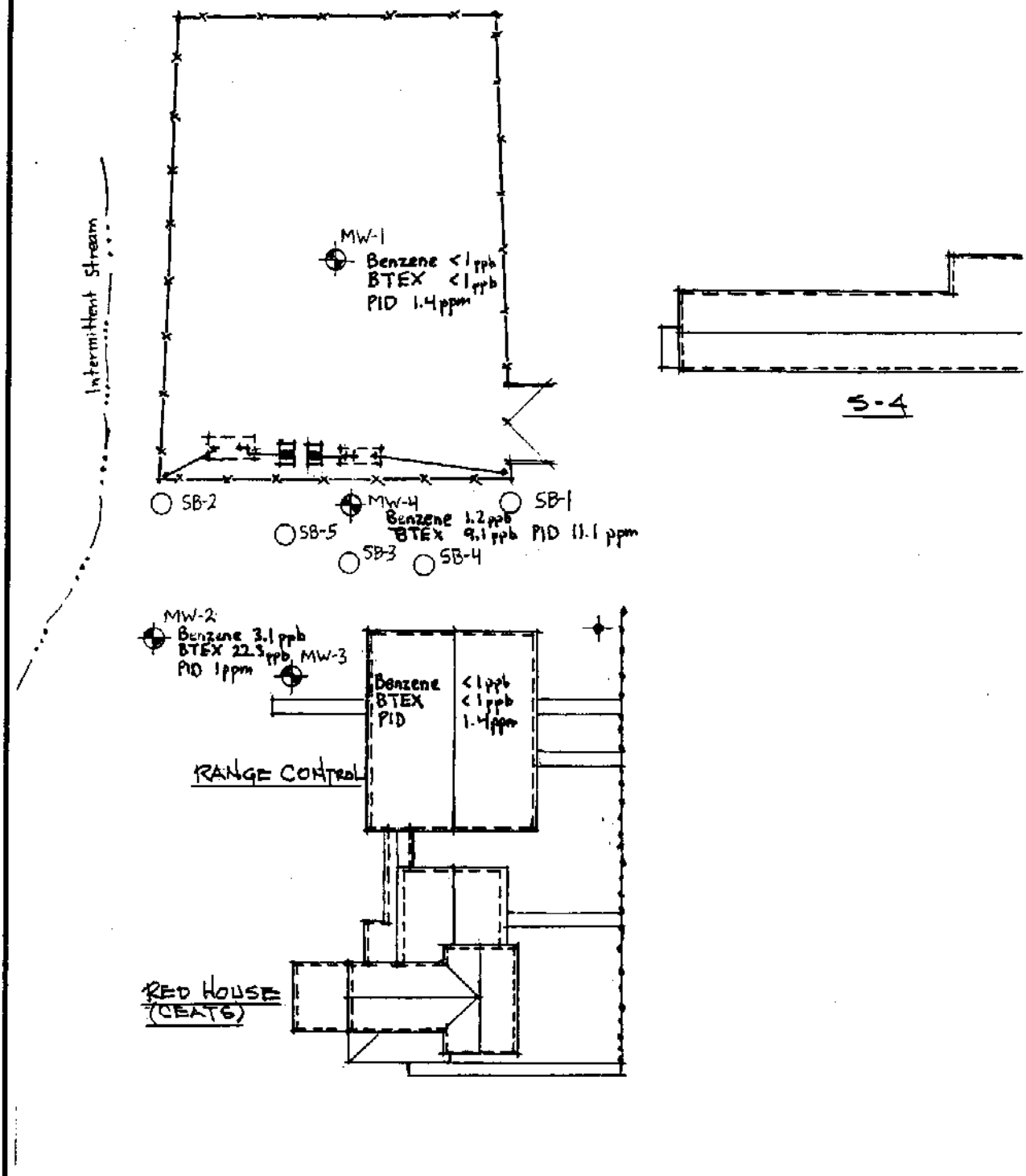
Notes:
Measurements in decimal feet
Bench mark: top of concrete sauna tube at northwest corner of Range Control building
Bench mark elevation: 100.00 feet

**Watershed Environmental Services, Inc.**
**P.O. Box 64947 Burlington, Vermont 05406**

# CONTAMINANT DISTRIBUTION MAP

## RANGE CONTROL FACILITY

## VT NATIONAL GUARD ETHAN ALLEN FIRING RANGE, JERICHO, VT




| | |
|---|---|
| ***Scale:*** 1" = 40' | ***Prepared:*** August 30, 1996 |
| ***Date of Sampling:*** August 20, 1996 | |
| ***Map Source:*** Vermont Army National Guard Camp Johnson, Colchester, VT | **WATERSHED ENVIRONMENTAL SERVICES** P.O. Box 64947 Burlington, Vermont 05406 |

# Watershed Environmental Services, Inc.

P.O. Box 64947 Burlington, Vermont 05406 Office: 802-860-7385 FAX: 802-860-1964 *51


## VERMONT NATIONAL GUARD ETHAN ALLEN FIRING RANGE
## RANGE CONTROL FACILITY
## Jericho, Vermont

# SOIL BORING LOG - August 12, 1996



**MW-1**

**SOIL BORING/ MONITORING WELL MW-1**

Location: 40 ft. north of former gasoline UST site (up-gradient monitoring point).
Background PID reading: 0.4 ppm; PID: H-Nu Systems model PI-101 with 10.2 eV lamp
Surface: gravel

| Sample Interval | PID reading | Soil Description |
|---|---|---|
| 0 - 4.5 ft AS | 0.4 ppm | Dry, brown sand and gravel fill |
| 4.5 - 5.0 ft AS | 0.4 ppm | Moist, dark brown - black silty fine sand |
| 5.0 - 7.0 ft SS | 0.5 ppm | Wet, brown silty fine sand |
| 7.0 - 10.0 AS | 0.5 ppm | Wet, brown silty fine sand |
| 10.0 - 12.0 ft SS | 0.5 ppm | Saturated, brown sand and gravel |

**Well Construction:**

Pipe: 2 in. sch. 40 PVC, flush-coupled, F480 thread
Screen: 5 ft. section 0.010 ft factory slot screen
Screen interval: 4.0 - 9.0 ft
Sand pack: 3.2 - 10.0 ft
Bentonite: 2.0 - 3.2 ft
Well Protector: 8 in. dia. flush-mount steel casing with cement

**MW-2**

**SOIL BORING/MONITORING WELL MW-2**

Location: 66 ft. southwest of gasoline UST site.
Background PID reading: 0.4 ppm
Surface: Gravel

| Sample Interval | PID reading | Soil Description |
|---|---|---|
| 0 - 4.0 ft AS | 0.4 ppm | Dry, brown sandy gravel fill with stones and cobbles |
| 4.0 - 5.0 ft AS | 0.8 ppm | Dry, olive gray very fine sandy silt loam fill |
| 5.0 - 7.0 ft SS | 1.1 ppm | Wet, olive gray silty fine sand with organic matter (old ground surface) |
| 7.0 - 10.0 ft AS | 0.9 ppm | Wet, olive gray silty gravel |
| 10.0 - 12.0 ft SS | 0.9 ppm | Saturated, olive-gray to rusty brown pebbly fine to medium fine sand |

**Well Construction:**

Pipe: 2 in. sch. 40 PVC, flush-coupled, F480 thread
Screen: 7 ft. section 0.010 ft factory slot screen
Screen interval: 3.0 - 10.0 ft
Sand pack: 2.5 - 10.0 ft
Bentonite: 1.5 - 2.5 ft
Well Protector: 8 in. dia. flush-mounted steel casing with cement

# VERMONT NATIONAL GUARD ETHAN ALLEN FIRING RANGE
# RANGE CONTROL FACILITY
## Jericho, Vermont

# SOIL BORING LOG - AUGUST 12, 1996



**MW-3**

**SOIL BORING/MONITORING WELL MW-3**

Location: 55 ft. south of gasoline UST site.
Background PID reading: 0.4 ppm
Surface: gravel

| Sample Interval | PID reading | Soil Description |
|---|---|---|
| 0 - 5.0 ft AS | 0.8 ppm | Dry, brown medium sand and gravel fill |
| 5.0 - 7.0 ft SS | 1.5 ppm | Wet, olive gray pebbly medium to coarse sand |
| 7.0 - 10.0 ft AS | 1.0 ppm | Wet, olive gray silty fine sand |

**Well Construction:**

Pipe: 2 in. sch. 40 PVC, flush-coupled, F480 thread
Screen: 7 ft. section 0.010 ft factory slot screen
Screen interval: 3.0 - 10.0 ft
Sand pack: 2.6 - 10.0 ft
Bentonite: 1.6 - 2.6 ft
Well Protector: 4 in. dia. flush-mount steel casing with cement

**MW-4**

**SOIL BORING/MONITORING WELL MW-4**

Location: 10 ft. south of former gasoline UST excavation.
Background PID reading: 0.4 ppm
Surface: gravel

| Sample Interval | PID reading | Soil Description |
|---|---|---|
| 0 - 4.0 ft AS | 1.0 ppm | Dry, brown sand and gravel fill |
| 4.0 - 6.0 ft SS | 110.0 ppm | Damp, olive gray fine to medium sand with wood material over dark gray-black discolored coarse sand; slight stale gasoline odor |
| 6.0 - 10.0 ft AS | 110.0 ppm | Wet, dark gray discolored coarse sands with stale gasoline odor |
| 10.0 - 12.0 ft SS | 1.5 ppm | Saturated, brown stoney coarse sand; no odor |

**Well Construction:**

Pipe: 2 in. sch. 40 PVC, flush-coupled, F480 thread
Screen: 7 ft. section 0.010 ft factory slot screen
Screen interval: 3.0 - 10.0 ft
Sand pack: 2.5 - 10.0 ft
Bentonite: 1.5 - 2.5 ft
Well Protector: 8 in. dia. flush-mount steel road box casing with cement

**SB-1**

**SOIL BORING SB-1**

Location: Southeast corner of fenced compound approx. 40 ft. east of former gasoline UST site.
Background PID reading: 0.4 ppm
Surface: gravel

| Sample Interval | PID reading | Soil Description |
|---|---|---|
| 0 - 4.0 ft AS | 0.4 ppm | Dry, brown sand and gravel fill |
| 4.0 - 5.0 ft AS | 0.4 ppm | Damp, dark brown silty fine sand |
| 5.0 - 7.0 ft SS | 0.5 ppm | Moist, silty sand with pebbles over saturated sandy gravel |
| 7.0 - 10.0 ft AS | 0.5 ppm | Saturated, brown gravels |

**Note: soil boring plugged and abandoned**

# VERMONT NATIONAL GUARD ETHAN ALLEN FIRING RANGE
# RANGE CONTROL FACILITY
## Jericho, Vermont

# SOIL BORING LOG - AUGUST 12, 1996



SB-2

**SOIL BORING SB-2**

Location: Southwest corner of fenced compound approx. 50 ft. west of former gasoline UST site.
Background PID reading: 0.8 ppm
Surface: gravel

| Sample Interval | PID reading | Soil Description |
|---|---|---|
| 0 - 5.0 ft AS | 0.4 ppm | Dry, brown sand and gravel fill |
| 5.0 - 7.0 ft SS | 0.9 ppm | Moist, olive gray silty fine to very fine sand over dark brown silty loam with organic matter (old ground) |
| 7.0 - 10.0 ft AS | 0.9 ppm | Moist, olive gray silty loam over olive gray gravel |
| 10.0 - 12.0 ft AS | 0.9 ppm | Saturated, brown stoney gravels |
| **Note: soil boring plugged and abandoned** | | |

SB-3

**SOIL BORING SB-3**

Location: 37 ft. south of former gasoline UST site and 15 north of northwest corner of Range Control building.
Background PID reading: 0.8 ppm
Surface: gravel

| Sample Interval | PID reading | Soil Description |
|---|---|---|
| 0 - 1.5 ft AS | 0.8 ppm | Dry, brown sand and gravel fill |
| 1.5 - 4.0 ft AS | 0.8 ppm | Dry, brown gravelly silty fine sand |
| 4.0 - 5.0 ft AS | 3.0 ppm | Moist, dark brown very fine sandy silty loam with trace clay |
| 5.0 - 7.0 ft SS | 2.5 ppm | Saturated, olive gray pebbly fine sand |
| **Note: soil boring plugged and abandoned** | | |

SB-4

**SOIL BORING SB-4**

Location: 20 ft. east of soil boring SB-3.
Background PID reading: 0.8 ppm
Surface: gravel

| Sample Interval | PID reading | Soil Description |
|---|---|---|
| 0 - 4.0 ft AS | 0.8 ppm | Dry, brown sand and gravel fill |
| 4.0 - 6.0 ft SS | 0.9 ppm | Wet, olive gray pebbly fine sand |
| **Note: soil boring plugged and abandoned** | | |

SB-5

**SOIL BORING SB-5**

Location: 20 ft. southwest of former gasoline UST site.
Background PID reading: 0.8 ppm
Surface: gravel

| Sample Interval | PID reading | Soil Description |
|---|---|---|
| 0 - 4.0 ft AS | 0.8 ppm | Dry, brown sand and gravel fill over silty fine sand |
| 4.0 - 6.0 ft SS | 14.0 ppm | Wet, dark brown silty fine sand with organic matter |
| **Note: soil boring plugged and abandoned** | | |

**Notes: AS = Auger Spoils sample; SS = Split-Spoon sample; ppm = parts per million**

# SOIL PROBE LOG


MW# # 1
Range Control
Jericho, VT

TRI STATE
DRILLING & BORING, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123

| | SAMPLER | |
|---|---|---|
| | | Continuous |
| TYPE | _____ | _____ |
| SIZE | _____ | _____ |
| HAMMER | _____ | _____ |
| FALL | _____ | _____ |

SOIL
Saturated
Wet
Moist
Damp
Slightly Damp

DATE STARTED: 8/12/96 DATE COMPLETED: 8/12/96

| FOOTAGE DEPTH | BLOW COUNTS REC | DRILLER'S NOTES & COMMENTS |
|---|---|---|
| | 6 12 18 24 | |
| 5-7' | 1.2 1.2 1.5 1.5 | Moist Silty fine sand , Dark gray. |
| 10-12' | 1.8 for 24" | Wet Sandy gravel. |
| | | Sand 10' to 3', Chips 3' to 2' |
| | | 20 Slot screen 9' to 4' , Riser to surface |

Project: Range Control
Location: Jericho, VT
Engineer: Water Shed Env. Svc.
Inspector: Mike Sparks

Driller: Neal S. Faulkner
Helper: George E. Colburn
Materials: 5' screen, 5' riser,
1 locking plug, 2 bags of sand,
1 road box, 1/2 Bag of chips.

# SOIL PROBE LOG

TRI STATE
DRILLING & BORING, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123

| | SAMPLER | |
|---|---|---|
| | | Continuous |
| TYPE | _____ | _____ |
| SIZE | _____ | _____ |
| HAMMER | _____ | _____ |
| FALL | _____ | _____ |

SOIL
Saturated
Wet
Moist
Damp
Slightly Damp

DATE STARTED: 8/12/96 DATE COMPLETED: 8/12/96

| FOOTAGE DEPTH | BLOW COUNTS (6 12 18 24) | REC | | DRILLER'S NOTES & COMMENTS |
|---|---|---|---|---|
| 5-7' | 3 | 4 | 10" | Moist — Silty fine sand. |
| 10-12' | 8 to 12 | | 12" | Wet |

Screen 10' to 3' , Riser to surface
#1 sand 10' to 2 1/2 chips 2 1/2 to 1 1/2.

Client: Range Control
Job Location: Jericho, VT
Engineer: Water Shed Env. Svc.
Inspector: Mike Sparks

Driller: Neal S Faulkner
Helper: George E. Colburn
Materials: 10' Screen 10 slot, 5' riser 1 locking plug, 3 Bags of sand, 1/2 bag chips , 1 road box.te.

# SOIL PROBE LOG


MW # 3
Range Control
Jericho, VT

TRI STATE
DRILLING & BORING, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123

| | SAMPLER | |
|---|---|---|
| | | Continuous |
| TYPE | _____ | _____ |
| SIZE | _____ | _____ |
| HAMMER | _____ | _____ |
| FALL | _____ | _____ |

SOIL
Saturated
Wet
Moist
Damp
Slightly Damp

DATE STARTED: 8/12/96 DATE COMPLETED: 8/12/96

| FOOTAGE DEPTH | BLOW COUNTS (6 12 18 24) | REC | | DRILLER'S NOTES & COMMENTS |
|---|---|---|---|---|
| .5-7' | 1 2 2 4 | 5 | 16" | Wet — Dark gray silty sand & course sand , 4" of wood. |
| 10-12' | 5 10 6 10 | 14" | | Wet — Red brown & olive brown, fine to course sandy gravel, strong gas odor. |

20 slot screen 10' to 3', riser to surface
#1 sand 10' to 2'6" chips 2'6" to 1'6"

Client: Range Control
Job Location: Jericho, VT
Engineer: Water Shed Env. Svc.
Inspector: Mike Sparks

Driller: Neal S. Faulkner
Helper: George E. Colburn
Materials: 10' screen , 5' riser, 1 locking plug, 3 bags of sand, 1/2 bag chips, 1 road box.

# SOIL PROBE LOG


MW# # 4
Range Control
Jericho, VT

TRI STATE
DRILLING & BORING, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123

| | | SAMPLER Continuous |
|---|---|---|
| TYPE | _____ | _____ |
| SIZE | _____ | _____ |
| HAMMER | _____ | _____ |
| FALL | _____ | _____ |

SOIL
Saturated
Wet
Moist
Damp
Slightly Damp

DATE STARTED: 8/12/96 DATE COMPLETED: 8/12/96

| FOOTAGE DEPTH | BLOW COUNTS | REC | | DRILLER'S NOTES & COMMENTS |
|---|---|---|---|---|
| | 6 12 18 24 | | | |
| 5-7' | 4 6 5 | 4 | 14" | Wet — Fine to course sand, slight gas odor. |
| | | | | Augered to 10'. |
| | | | | Sand 10' to 2'6" riser 2'6" to 1'6" |
| | | | | 20 Slot screen 10' to 3' , Riser to surface |

Project: Range Control
Location: Jericho, VT
Engineer: Water Shed Env. Svc.
Inspector: Mike Sparks

Driller: Neal S. Faulkner
Helper: George E. Colburn
Materials: 10' screen, 5' riser, 1 locking plug, 2 bags of sand, 1 road box, 1/2 Bag of chips.

# SOIL PROBE LOG


Boring #1
Range control
Jericho, VT

TRI STATE
DRILLING & BORING, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123

| | SAMPLER | |
|---|---|---|
| | Continuous | |
| TYPE | _____ | _____ |
| SIZE | _____ | _____ |
| HAMMER | _____ | _____ |
| FALL | _____ | _____ |

SOIL
Saturated
Wet
Moist
Damp
Slightly Damp

DATE STARTED: 8/12/96 DATE COMPLETED: 8/12/96

| FOOTAGE DEPTH | BLOW COUNTS (6 12 18 24) | REC | | | | | DRILLER'S NOTES & COMMENTS |
|---|---|---|---|---|---|---|---|
| .5-7' | 12 | 12 | 7 | 7 | 16" | Wet | Olive brown sandy gravel. |
| | | | | | | | Augered to 10' , No spoon. |

Client: Range Control
Job Location: Jericho, VT
Engineer: Water Shed Env. Svc.
Inspector: Mike Sparks

Driller: Neal S Faulkner
Helper: George E. Colburn
Materials:

# SOIL PROBE LOG


Boring #2
Range Control
Jericho, VT

TRI STATE
DRILLING & BORING, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123

---

| | SAMPLER | |
|---|---|---|
| | | Continuous |
| TYPE | _____ | _____ |
| SIZE | _____ | _____ |
| HAMMER | _____ | _____ |
| FALL | _____ | _____ |

SOIL
Saturated
Wet
Moist
Damp
Slightly Damp

DATE STARTED: 8/12/96 DATE COMPLETED: 8/12/96

| FOOTAGE DEPTH | BLOW COUNTS (6 12 18 24) | REC | | DRILLER'S NOTES & COMMENTS |
|---|---|---|---|---|
| .5-7' | 1 1 3 4 | 18" | Moist | Silty fine sand over silt loom. |
| 10-12' | 8 to 12 | 12" | Wet | Sandy gravel. |

Client: Range Control
Job Location: Jericho, VT
Engineer: Water Shed Env. Svc.
Inspector: Mike Sparks

Driller: Neal S. Faulkner
Helper: George E. Colburn
Materials:

# SOIL PROBE LOG

TRI STATE
DRILLING & BORING. INC.
RFD #2, Box 113 West Burke, VT .05871
(802) 467-3123

| | SAMPLER Continuous |
|---|---|
| TYPE | |
| SIZE | |
| HAMMER | |
| FALL | |

SOIL
Saturated
Wet
Moist
Damp
Slightly Damp

DATE STARTED: 8/12/96 DATE COMPLETED: 8/12/96

| FOOTAGE DEPTH | BLOW COUNTS (6 12 18 24) | REC | | DRILLER'S NOTES & COMMENTS |
|---|---|---|---|---|
| 5-7' | 4 | 5 | 10" | Wet — Fine sand & gravel, slight gas odor. |

Project: Range Control
Location: Jericho, VT
Engineer: Water Shed Env. Svc.
Inspector: Mike Sparks

Driller: Neal S. Faulkner
Helper: George E. Colburn
Materials:

# SOIL PROBE LOG

TRI STATE
DRILLING & BORING, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123


Boring #4
Range control
Jericho, VT

| | SAMPLER | Continuous |
|---|---|---|
| TYPE | | |
| SIZE | | |
| HAMMER | | |
| FALL | | |

SOIL
Saturated
Wet
Moist
Damp
Slightly Damp

DATE STARTED: 8/12/96 DATE COMPLETED: 8/12/96

| FOOTAGE DEPTH | BLOW COUNTS 6 12 18 24 | REC | DRILLER'S NOTES & COMMENTS |
|---|---|---|---|
| .4-6' | 3\|5\|6\|10 | 12" Wet | Fine sand & gravel. |

Client: Range Control
Job Location: Jericho, VT
Engineer: Water Shed Env. Svc.
Inspector: Mike Sparks

Driller: Neal S Faulkner
Helper: George E. Colburn
Materials:

# SOIL PROBE LOG

TRI STATE
DRILLING & BORING, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123


Boring #5
Range Control
Jericho, VT

| | | SAMPLER Continuous |
|---|---|---|
| TYPE | _____ | _____ |
| SIZE | _____ | _____ |
| HAMMER | _____ | _____ |
| FALL | _____ | _____ |

SOIL
Saturated
Wet
Moist
Damp
Slightly Damp

DATE STARTED: 8/12/96 DATE COMPLETED: 8/12/96

| FOOTAGE DEPTH | BLOW COUNTS (6 12 18 24) | REC | | DRILLER'S NOTES & COMMENTS |
|---|---|---|---|---|
| 4-6' | 1 1 2 4 | 10" | Wet | Fine sand & silt wood, Strong gas odor. |

Client: Range Control
Job Location: Jericho, VT
Engineer: Water Shed Env. Svc.
Inspector: Mike Sparks

Driller: Neal S. Faulkner
Helper: George E. Colburn
Materials:

**VERMONT NATIONAL GUARD RANGE CONTROL FACILITY**
**ETHAN ALLEN FIRING RANGE, JERICHO, VT**

**TABLE 2**
**GROUNDWATER QUALITY SAMPLING RESULTS**
**AUGUST 20, 1996 SAMPLING EVENT**

| | | STATION / CONCENTRATION | | | | |
|---|---|---|---|---|---|---|
| **EPA Method 8020** | **PARAMETER** | **MW-1** | **MW-2** | **MW-3** | **MW-4** | **Trip Blank** |
| | Benzene (ug/L) | <1 | 3.1 | <1 | 1.2 | <1 |
| | Ethylbenzene (ug/L) | <1 | 8 | <1 | 1.7 | <1 |
| | Toluene (ug/L) | <1 | 1.2 | <1 | <1 | <1 |
| | Xylene (ug/L) | <1 | 10 | <1 | 6.2 | <1 |
| | MTBE (ug/L) | <10 | <10 | <10 | <10 | <10 |
| | Total BTEX (ug/L) | <1 | 22.3 | <1 | 9.1 | <1 |
| **Head-space Screening** | PID Vapor Reading (ppm) | 1.4 | 1 | 1.4 | 11.1 | |

*vng-jeri.wq1 sheet 2*

Watershed Environmental Services, Inc.
P.O. Box 64947 Burlington, VT 05406

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

# REPORT OF LABORATORY ANALYSIS

CLIENT: Watershed Environmental Services, Inc. PROJECT CODE: WATR1846
PROJECT NAME: VNG - Jericho RL REF.#: 92,834 - 92,838
REPORT DATE: August 28, 1996
DATE SAMPLED: August 18-20, 1996

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures

ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

# LABORATORY REPORT

## EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Watershed Environmental Services, Inc.
PROJECT NAME: VNG - Jericho RL
REPORT DATE: August 28, 1996
DATE SAMPLED: August 20, 1996
DATE RECEIVED: August 22, 1996
DATE ANALYZED: August 27, 1996

PROJECT CODE: WATR1846
REF.#: 92,834
STATION: MW-1
TIME SAMPLED: 7:30
SAMPLER: Mike Sparks

| Parameter | Detection Limit (ug/L) | Concentration (ug/L) |
|---|---|---|
| Benzene | 1 | ND[1] |
| Chlorobenzene | 1 | ND |
| 1,2-Dichlorobenzene | 1 | ND |
| 1,3-Dichlorobenzene | 1 | ND |
| 1,4-Dichlorobenzene | 1 | ND |
| Ethylbenzene | 1 | ND |
| Toluene | 1 | ND |
| Xylenes | 1 | ND |
| MTBE | 10 | ND |

Bromobenzene Surrogate Recovery: 94%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 None detected

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# LABORATORY REPORT

## EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Watershed Environmental Services, Inc.
PROJECT NAME: VNG - Jericho RL
REPORT DATE: August 28, 1996
DATE SAMPLED: August 20, 1996
DATE RECEIVED: August 22, 1996
DATE ANALYZED: August 28, 1996

PROJECT CODE: WATR1846
REF.#: 92,835
STATION: MW-2
TIME SAMPLED: 7:45
SAMPLER: Mike Sparks

| Parameter | Detection Limit (ug/L) | Concentration (ug/L) |
|---|---|---|
| Benzene | 1 | 3.1 |
| Chlorobenzene | 1 | ND[1] |
| 1,2-Dichlorobenzene | 1 | ND |
| 1,3-Dichlorobenzene | 1 | ND |
| 1,4-Dichlorobenzene | 1 | ND |
| Ethylbenzene | 1 | 8.0 |
| Toluene | 1 | 1.2 |
| Xylenes | 1 | 10.0 |
| MTBE | 10 | ND |

Bromobenzene Surrogate Recovery: 104%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

NOTES:

1 None detected

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# LABORATORY REPORT

## EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Watershed Environmental Services, Inc.
PROJECT NAME: VNG - Jericho RL
REPORT DATE: August 28, 1996
DATE SAMPLED: August 20, 1996
DATE RECEIVED: August 22, 1996
DATE ANALYZED: August 28, 1996

PROJECT CODE: WATR1846
REF.#: 92,836
STATION: MW-3
TIME SAMPLED: 8:00
SAMPLER: Mike Sparks

| Parameter | Detection Limit (ug/L) | Concentration (ug/L) |
|---|---|---|
| Benzene | 1 | ND[1] |
| Chlorobenzene | 1 | ND |
| 1,2-Dichlorobenzene | 1 | ND |
| 1,3-Dichlorobenzene | 1 | ND |
| 1,4-Dichlorobenzene | 1 | ND |
| Ethylbenzene | 1 | ND |
| Toluene | 1 | ND |
| Xylenes | 1 | ND |
| MTBE | 10 | ND |

Bromobenzene Surrogate Recovery: 96%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 None detected

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# LABORATORY REPORT

## EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Watershed Environmental Services, Inc.
PROJECT NAME: VNG - Jericho RL
REPORT DATE: August 28, 1996
DATE SAMPLED: August 20, 1996
DATE RECEIVED: August 22, 1996
DATE ANALYZED: August 28, 1996

PROJECT CODE: WATR1846
REF.#: 92,837
STATION: MW-4
TIME SAMPLED: 8:15
SAMPLER: Mike Sparks

| Parameter | Detection Limit (ug/L) | Concentration (ug/L) |
|---|---|---|
| Benzene | 1 | 1.2 |
| Chlorobenzene | 1 | 1.7 |
| 1,2-Dichlorobenzene | 1 | ND[1] |
| 1,3-Dichlorobenzene | 1 | ND |
| 1,4-Dichlorobenzene | 1 | ND |
| Ethylbenzene | 1 | 1.8 |
| Toluene | 1 | ND |
| Xylenes | 1 | 6.2 |
| MTBE | 10 | ND |

Bromobenzene Surrogate Recovery: 92%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

NOTES:

1 None detected

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# LABORATORY REPORT

## EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Watershed Environmental Services, Inc.
PROJECT NAME: VNG - Jericho RL
REPORT DATE: August 28, 1996
DATE SAMPLED: August 18, 1996
DATE RECEIVED: August 22, 1996
DATE ANALYZED: August 28, 1996

PROJECT CODE: WATR1846
REF.#: 92,838
STATION: Trip Blank
TIME SAMPLED: 5:30
SAMPLER: Mike Sparks

| Parameter | Detection Limit (ug/L) | Concentration (ug/L) |
|---|---|---|
| Benzene | 1 | ND[1] |
| Chlorobenzene | 1 | ND |
| 1,2-Dichlorobenzene | 1 | ND |
| 1,3-Dichlorobenzene | 1 | ND |
| 1,4-Dichlorobenzene | 1 | ND |
| Ethylbenzene | 1 | ND |
| Toluene | 1 | ND |
| Xylenes | 1 | ND |
| MTBE | 10 | ND |

Bromobenzene Surrogate Recovery: 93%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 None detected

ENDYNE, INC.

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18858

# CHAIN-OF-CUSTODY RECORD

Project Name: VNG-Jericho RC
Site Location: Ethan Allen Firing Range, Jericho
Endyne Project Number: WATR1846

Reporting Address: Watershed Env. Svc. Inc.
P.O. Box 64997 Burlington, VT 05406
Company: Watershed
Contact Name/Phone #: Mike Sparks 860-1964

Billing Address: Watershed

Sampler Name: Mike Sparks
Phone #: 402-860-2355

| Lab # | Sample Location | Matrix* | GRAB | COMP | Date/Time | Sample Containers No. | Sample Containers Type/Size | Field Results/Remarks | Analysis Required | Sample Preservation | Rush |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 92,834 | MW-1 | Water | | | 8/20/96 1:30p | 2 | VOA | | 8020 | HCl | 10 |
| 92,835 | MW-2 | | | | 7:45p | 2 | VOA | | | | |
| 92,836 | MW-3 | | | | 8pm | 2 | | | | | |
| 92,837 | MW-4 | | | | 8:15p | 2 | | | | | |
| 92,838 | Trip Blank | | | | 5:30a 8/18/96 | 2 | | | | None | |

Relinquished by: Signature: [signature]
Received by: Signature: [signature]
Date/Time: 8/22/96 1:20

Relinquished by: Signature:
Received by: Signature:
Date/Time:

New York State Project: Yes ____ No ____

## Requested Analyses

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | pH | 6 | TKN | 11 | Total Solids | 16 | Metals (Specify) | 21 | EPA 624 | 26 | EPA 8270 B/N or Acid |
| 2 | Chloride | 7 | Total P | 12 | TSS | 17 | Coliform (Specify) | 22 | EPA 625 B/N or A | 27 | EPA 8010/8020 |
| 3 | Ammonia N | 8 | Total Diss. P | 13 | TDS | 18 | COD | 23 | EPA 418.1 | 28 | EPA 8080 Pest/PCB |
| 4 | Nitrite N | 9 | $BOD_5$ | 14 | Turbidity | 19 | BTEX | 24 | EPA 608 Pest/PCB | | |
| 5 | Nitrate N | 10 | Alkalinity | 15 | Conductivity | 20 | EPA 601/602 | 25 | EPA 8240 | | |
| 29 | TCLP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides) | | | | | | | | | | |
| 30 | Other (Specify): | | | | | | | | | | |